

GLOBAL MRI ACADEMY

MRI Anatomy Guide

A Practical Cross-Sectional Anatomy & MRI Correlation Guide

Brain • Spine • Upper Extremities • Lower Extremities • Abdomen • Pelvis

For MRI students, technologists, and ARRT/ARMRIT exam preparation.

Global MRI Academy

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How to Use This Guide

Learn anatomy together with imaging plane, MRI sequence, and clinical purpose. Use landmarks first, then trace structures across adjacent slices.

Core learning method

- **1. Identify the plane:** axial, sagittal, or coronal.
- **2. Find landmarks:** start with reliable bones, joints, organs, or vessels.
- **3. Trace structures:** follow them across multiple slices.
- **4. Correlate sequences:** compare T1, T2, fluid-sensitive, and post-contrast images when appropriate.
- **5. Apply clinically:** connect anatomy to the indication and protocol.

MRI planes at a glance

Plane	Shows well	Common uses
Axial	Cross-sectional left/right relationships	Brain, spine, joints, extremities, abdomen, pelvis
Sagittal	Longitudinal superior/inferior relationships	Spine, knee, shoulder, ankle, brain
Coronal	Bilateral and anterior/posterior relationships	Shoulder, hips, abdomen, pelvis, extremities

Study tip: Learn anatomy in the same orientation used by your scanner and PACS viewer.

1. Brain Anatomy & MRI Correlation

Key structures

- Frontal, parietal, temporal, and occipital lobes.
- Cerebral cortex and underlying white matter.
- Corpus callosum, internal capsule, basal ganglia, and thalami.
- Lateral, third, and fourth ventricles and cerebral aqueduct.
- Hippocampi, brainstem, cerebellum, and major cisterns.

MRI / plane correlation

- **Sagittal landmarks:** corpus callosum, pituitary/sella, brainstem, cerebellar vermis, fourth ventricle.
- **T1:** strong structural assessment; white matter is usually brighter than gray matter.
- **T2:** fluid is usually bright and useful for many abnormalities.
- **FLAIR:** suppresses free fluid and helps highlight many periventricular/cortical abnormalities.
- **DWI/ADC:** important for restricted diffusion, especially suspected acute ischemia.
- **SWI/GRE:** sensitive to susceptibility from blood products and other sources.

2. Spine Anatomy & MRI Correlation

Key structures

- Cervical, thoracic, and lumbar vertebral bodies, pedicles, laminae, transverse and spinous processes.
- Intervertebral discs: nucleus pulposus and annulus fibrosus.
- Facet joints and major spinal ligaments.
- Spinal cord, conus medullaris, cauda equina, and nerve roots.
- CSF spaces and the thecal sac.

MRI / plane correlation

- **Sagittal:** alignment, discs, cord, and canal overview.
- **Axial:** discs, facets, lateral recesses, foramina, and roots.
- Confirm vertebral levels with reliable landmarks.
- Review sagittal and axial images together.

3. Upper Extremity — Shoulder

Key structures

- Humeral head, greater and lesser tuberosities, glenoid, coracoid, and acromion.
- Rotator cuff: supraspinatus, infraspinatus, teres minor, and subscapularis.
- Long head of biceps tendon and bicipital groove.
- Glenoid labrum, capsule, and acromioclavicular joint.
- Deltoid and surrounding soft tissues.

MRI / plane correlation

- **Coronal oblique:** rotator cuff, subacromial space, and AC joint.
- **Sagittal oblique:** muscle bulk and cuff relationships.
- **Axial:** labrum, biceps, subscapularis, and glenohumeral anatomy.

4. Upper Extremity — Elbow

Key structures

- Distal humerus: capitellum, trochlea, medial and lateral epicondyles.
- Proximal radius and ulna: radial head, coronoid, olecranon.
- Common flexor and extensor tendons.
- Ulnar collateral ligament and lateral collateral ligament complex.
- Biceps and triceps tendons; ulnar nerve in the cubital tunnel.

MRI / plane correlation

- **Axial:** tendons, muscles, nerves, and ligament relationships.
- **Coronal:** collateral ligaments, articular surfaces, and marrow.
- **Sagittal:** triceps/biceps insertion and joint alignment.

5. Upper Extremity — Wrist & Hand

Key structures

- Radius and ulna; carpal bones; metacarpals and phalanges.
- Scapholunate and lunotriquetral ligaments.
- Triangular fibrocartilage complex (TFCC).
- Flexor and extensor tendons and tendon sheaths.
- Median nerve in the carpal tunnel and ulnar-sided neurovascular structures.

MRI / plane correlation

- **Axial:** carpal tunnel, tendons, nerves, and soft tissues.
- **Coronal:** intrinsic ligaments, TFCC, marrow, and carpal alignment.
- **Sagittal:** carpal alignment and selected tendon/joint anatomy.

6. Lower Extremity — Hip

Key structures

- Femoral head and neck, acetabulum, labrum, and articular cartilage.
- Greater and lesser trochanters.
- Gluteus medius/minimus, iliopsoas, and proximal hamstring tendons.
- Adductor muscles and surrounding pelvic soft tissues.

MRI / plane correlation

- **Coronal:** hip joint, femoral head/neck, and abductor tendons.
- **Axial:** labrum, muscles, tendons, and neurovascular relationships.
- **Sagittal:** anterior/posterior joint structures and selected tendon anatomy.

7. Lower Extremity — Knee

Key structures

- Femur, tibia, fibula, patella, and articular cartilage.
- Medial and lateral menisci.
- ACL and PCL.
- MCL and lateral collateral ligament complex.
- Quadriceps tendon, patellar tendon, retinacula, and iliotibial band.

MRI / plane correlation

- **Sagittal:** cruciates, menisci, cartilage, and patellofemoral anatomy.
- **Coronal:** collateral ligaments, menisci, and compartments.
- **Axial:** patellofemoral and selected soft-tissue relationships.

8. Lower Extremity — Ankle & Foot

Key structures

- Tibia, fibula, talus, calcaneus, navicular, cuboid, and cuneiforms.
- Achilles tendon and plantar fascia.
- Anterior, medial, and lateral ankle ligament complexes.
- Peroneal, tibialis posterior, flexor, and extensor tendons.
- Metatarsals, phalanges, and major forefoot joints.

MRI / plane correlation

- **Axial:** ankle tendons, ligaments, neurovascular structures, and soft tissues.
- **Coronal:** hindfoot, ankle ligaments, marrow, and subtalar anatomy.
- **Sagittal:** Achilles tendon, plantar fascia, talus/calcaneus, and longitudinal alignment.

9. Abdominal Anatomy

Key structures

- Liver: lobes, caudate region, portal and hepatic veins.
- Gallbladder and biliary tree.
- Pancreas: head, uncinate process, body, and tail.
- Spleen, kidneys, and adrenal glands.
- Abdominal aorta, IVC, and major branches.

MRI / plane correlation

- **T1:** anatomy, fat characterization, and pre/post-contrast comparison.
- **T2:** fluid-containing structures and many lesions.
- **Fat-suppressed imaging:** useful for edema, inflammation, and enhancement.
- **MRCP:** heavily T2-weighted techniques demonstrate fluid-filled ducts.

10. Pelvic Anatomy

Key structures

- Bladder, ureters at the pelvic brim, and urethra.
- Rectum and mesorectal tissues.
- Pelvic bones, SI joints, and hips.
- Major pelvic muscles and neurovascular structures.
- Male: prostate and seminal vesicles; female: uterus, cervix, vagina, ovaries, and adnexa.

MRI / plane correlation

- **Axial:** side-to-side anatomy and pelvic compartments.
- **Sagittal:** anterior/posterior relationships and midline structures.
- **Coronal:** pelvic sidewalls, hips, and selected organ relationships.

11. Anatomy-to-Protocol Quick Reference

Region	Primary planes	Main anatomy targets
Brain	Axial + sagittal + coronal	Cortex, ventricles, deep gray, posterior fossa
Spine	Sagittal + axial	Cord, discs, canal, foramina, roots
Shoulder	Coronal oblique + axial + sagittal oblique	Rotator cuff, labrum, biceps, AC joint
Elbow	Axial + coronal + sagittal	Ligaments, tendons, joint surfaces, nerves
Wrist/Hand	Axial + coronal + sagittal	Carpal bones, TFCC, tendons, median nerve
Hip	Coronal + axial + sagittal	Labrum, cartilage, femoral head/neck, tendons
Knee	Sagittal + coronal + axial	Menisci, cruciates, cartilage, collateral ligaments
Ankle/Foot	Axial + coronal + sagittal	Ligaments, tendons, Achilles, plantar fascia
Abdomen	Axial + coronal; sagittal as needed	Liver, pancreas, kidneys, biliary system
Pelvis	Axial + sagittal + coronal	Bladder, reproductive organs, rectum, pelvic sidewalls

ARRT/ARMRIT study focus

- Know major anatomy by plane, not only by name.
- Know the major joints and their supporting ligaments, tendons, and muscles.
- Understand how anatomy changes across common MRI sequences.
- Practice landmarks before pathology.
- Explain why a plane or sequence is selected for a structure.
- Remember that protocols vary by scanner, institution, indication, and radiologist preference.

12. Final Anatomy Checklist

You should be able to:

- Identify major anatomy of the brain, spine, upper extremities, lower extremities, abdomen, and pelvis.
- Identify anatomy in axial, sagittal, and coronal orientation.
- Recognize major MRI landmarks used for planning.
- Describe expected tissue appearance on T1- and T2-weighted imaging.
- Explain common fluid-sensitive and fat-suppressed techniques.
- Trace important structures across multiple slices.
- Correlate anatomy with the clinical indication.
- Use the complete imaging set and clinical history rather than a single image.

Important note

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Shoulder	Coronal oblique + axial + sagittal oblique	Rotator cuff, labrum, biceps, AC joint
Knee	Sagittal + coronal + axial	Menisci, cruciates, cartilage, collateral ligaments
Abdomen	Axial + coronal; sagittal as needed	Liver, pancreas, kidneys, biliary system
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